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RESEARCHES CONCERNING THE CORRELATIONS BETWEEN SALINE SOILS AND SOME SPECIES OF *PLANTAGO* GENUS

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Abstract: The paper presents some aspects concerning the selective absorbtion characteristic to halophilous species of the *Plantago* genus in connection with soil moisture, contents of mineral nutrition elements in the soil of plant's rhizosphere and the concentration of the hydrosoluble components in plants and soil. All these particularities are an expression of the physiological processes of these halophilous ecoforms. The analysed halophilous species normally vegetate on the halomorphic soils in the Lower Plain of the Timis River, which presents a great diversity of saltiness and improper conditions for glycophytes [3].

Introduction

The paper analyses some adaptability particularities characteristic to halophyle species from *Plantago* genus, which vegetate on saline soils from Banat. The researched region is the Lower Plain of Timis River, from the west section of Banat's Plain.

The halophytes are vegetating on a variety of halohygromorphic, halomesomorphic and haloxeromorphic soils in the Lower Plain of the Timiş River and that presents a great diversity of saltiness on the surface, in depth and between the there types [3]. The halophilous flora, rich in halohygrophilic, halomesophilic and haloxerophilic species show an obvious ecological biodiversity, closely correlated with the biotop variations, from a pronounce haloxeromorphism to different types of halohygromorphism, repeatedly succeeded all over the vegetative period [4].

The specific aspects concerning the absorbtion of water, metabolisation and the accumulation of hydrosoluble components in plants reflect the adaptable particularities characteristic of these halophilous species of *Plantago* genus [1, 2, 5].

Material and Method

The content of mineral nutrition elements was determined conductivimetric in the soil of plant's rhizosphere and expressed in m.e./100 g.soil (Tab. 1). The content of hydrosoluble components were determined through conductivimetric method. (Tab. 1 and 2). The dry matter in soil and in the plants determined in oven at 105°C, allowed to know the water content and also the dry matter content, both values being expressed in percent.

The analysed halophile species were harvested, in the flowering period, from halomorphic soils from Becicherecu Mic village, 17 km north-west to Timişoara in Lower Plains of the Timiş River. The samples were collected in very different conditions of soil salinity: on surface - *Plantago tenuiflora*, in depth - *Plantago maritima* and between the there types for the rest of species.

The ratio between the soluble salts in plants and soils, the ratio between the soluble salts and synthesised substances in plants respectively were calculated on the basis of the determinations.

In the vegetation period the intensity and duration of flowering were determined in all analysed species, for construction of phytophenological spectrum.

Table 1: The soil content in macroelements and soluble salts with soil/water ratio

The soil of species rhisosphere	The macroelements from soil (m.e./100g soil)				The soluble salts from soil % (a) and soil/plant ratio (b)	
	Ca^{++}	Mg^{++}	K^{+}	Na^{+}	a	b
***Plantago maritima* L.**	0,62	0,11	0,65	5,6	3,75	1/5,4
***Plantago tenuiflora* W. et K.**	0,61	0,21	0,73	5,8	2,06	1/5
***Plantago schwarzenbergiana* Schur**	0,75	0,31	0,87	7,4	2,08	1/3,9
***Plantago major* L.**	1,84	0,68	1,24	9.5	2,35	1/2,5
***Plantago media* L.**	1,87	0,75	1,57	9,0	2,82	1/2,1

Results and Discussions

The analysed halophile species are normally vegetating on saltiness, in conditions of high concentrations of hydrosoluble salts in soil, which determine recurrent variations from hygromezzohalomorphism at xerohalomorphism [3, 6, 7].

The high concentration of salts in soils (Na_2SO_4) and the deficit of soil water content in plant's rizosphere (Tab.1) determine improper conditions for water absorbtion [4, 7, 8]. The analysed halophyle species have the capacity to absorb water, to selectively absorb and to metabolize macroelements K^{+}, Mg^{++}, Ca^{++}, even if these are deficient in soil.

Table 2: The content in water and the hydrosoluble compounds of halophylous species of *Plantago* genus

Species of *Plantago* genus	The plant water content %	Hydrosoluble compounds (%)			
		Total	Salts (a)	Organic compounds (b)	Ratio a/b
***Plantago maritima* L.**	9,57	58,91	20,25	38,66	1/1,9
***Plantago tenuiflora* W. et K.**	10,85	36,05	10,30	25,75	1/2,5
***Plantago schwarzenbergiana* Schur**	10,88	36,54	8,12	28,42	1/3,5
***Plantago major* L.**	11,56	44,53	14,56	29,97	1/2
***Plantago media* L.**	10,08	49,59	16,53	33,06	1/2

The ratio between the soluble salt in soil and plants determines high values in species of *Plantago* genus from 1:5,40 at *Plantago maritima,* 1: 3,9 at *Plantago schwarzenbergiana*, both obligated halophytes.

The high osmotic potential is maintained through high concentrations of hydrosoluble components in plants (Tab. 2). The total hydrosoluble components in plants in % reaches the values of 58,91% in *Plantago maritima*, 36,05 % and in *Plantago tenuiflora*. All these components include the absorbed soluble salts, but especially the biosynthesised organic substances with high values of 29,97 at *Plantago major* and 36,06 at *Plantago media* (Tab. 2), both accidental halophytes.

The ratio between the macroelements selectively absorbed in soils, metabolised or accumulated in plants and the biosynthesised organic substances (Tab. 2) is clearly in favour of the biosynthesised ones at analysed species.

The obligated halophyle species *Plantago maritima* and *Plantago schwarzenbergiana* by type reglator – accumulator are differentiated by *Plantago tenuiflora* with 36,05 total soluble compounds, the obligated halophyle by type reglator-excretor.

The accidental species of *Plantago major* and *Plantago media*, which vegetate on the salted soils, in selective absorbtion conditions, present the quality to be impermeable for some

kinds of salts, water absorbtion being made focussing on organic compounds (29,97 and 33,06 respectively). They vegetate on soils with low levels of salinity and present a large ecological amplitude.

Table 3: The phytophenological spectrum of halophyle species of *Plantago* genus

Species	The flowering stage (months)											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
***Plantago maritima* L.**						■	■	■	■			
***Plantago tenuiflora* W. et K.**												
***Plantago schwarzen-bergiana* Schur**			■	■	■							
***Plantago major* L.**						■	■	■	■	■		
***Plantago media* L.**						■	■	■	■			

The phytophenological spectrum (Tab. 3) of halophyle species of *Plantago* genus in the Lower Plain of the Timiş River point out close correlations soil – plants and adaptability particularities for halophylle types corresponding to these species.

Conclusions

- The halophile species of *Plantago* genus present some ecological particularities, which allow them to absorb and to metabolize different quantities of salts in the soil and to vegetate normally on saltiness.
- The correlations between saline soils and some species of *Plantago* genus which vegetate on saline soils from Banat are an expression of the physiological processes of these halophilous ecoforms.
- The selective absorbtion of K^{+}, Mg^{++} and Ca^{++} in condition of very reduced ratio on saline soils, has specific proper characteristics regarding the accumulation and metabolisation of the organic compounds.
- The possibilities of absorbed salts, metabolisation or accumulation in different ratios, compared to its concentration on biotop, the flowering duration and phytophenological spectrum, characterise the physiological processes on halophyle species of *Plantago* genus and which vegetate on saline soils from Banat's Plain.

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CERCETĂRI PRIVIND CORELAȚIILE DINTRE SOLURILE SĂRĂTURATE ŞI UNELE SPECII ALE GENULUI *PLANTAGO*

(Rezumat)

Cercetările s-au efectuat în câmpia joasă a Timişului, în apropierea localității Becicherecu Mic (la 17 km nord vest de Timişoara). Particularitățile privind corelațiile sol – plantă au fost studiate la specii halofile aparținătoare genului *Plantago*, evidențiind o diversitate de modalități adaptative în funcție de gradul şi calitatea salinizării. Halofitele analizate absorb şi acumulează din sol cantități diferite dar relativ mari de săruri şi prezintă proporții relativ ridicate de componente organice hidrosolubile în conținutul lor de substanță uscată. *Plantago schwarzenbergiana* Schur*, Plantago maritima* L. şi *Plantago tenuiflora* W. et. K., toate halofite obligatorii de tip reglator acumulator sau excretor, prezintă particularități adaptative specifice. *S*peciile accidental halofile *Plantago major* L. şi *Plantago media* L. confirmă, în condițiile absorbției selective a ionilor, calitatea lor de rezistență la stresul salin [8]. Ele au amplitudine ecologică largă, cu posibilități de formare în filogenie a unor ecoforme caracteristice biotopurilor mai slab salinizate din Banat şi particularități adaptative proprii tipurilor halofile corespunzătoare acestor specii.